

## **Assessment of Water Usage and Consumption of Livestock Enterprises in Bursa Region**

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**Abstract:** Today, it is necessary to be more careful in water usage due to increased pollution in ground water and negative effects of climatic conditions on water resources. Farmers engaged in animal husbandry should enable to obtain drinking and utility water for animals by easily, in a healthy and economical way, and farmer's awareness of water consumption should be increased.

In this study, the annual water consumption of the animal barns was determined according to the animal existence in the Bursa region. According to TUIK 2017 data, there are 201 288 head cattle, 472467 head small sheep and approximately 1.3 million head poultry in Bursa province, and their total annual water requirement is 8.65 million m<sup>3</sup>. There is 44% increased on water consumption from animal production compared to 2007.

In this study, the amounts of annual water demand of 4 different dairy cattle operations with 20, 50, 100 and 200 head capacities have been calculated because water has an important effect on milk yield especially in dairy cattle. The water consumption of these enterprises was respectively 648 m<sup>3</sup>, 1620 m<sup>3</sup>, 3240 m<sup>3</sup> and 6480 m<sup>3</sup> per year. The annual drinking and utility water costs of the enterprises are calculated as 2 722 ₺, 6 804 ₺, 13 608 ₺ and 27 216 ₺. In addition, drinking water samples were taken from 15 dairy cattle barns in Nilüfer district of Bursa province and were analysed for water quality.

**Keywords:** Dairy cattle, Water consumption, Bursa, Water quality

### **Introduction**

The water is usually on the second plan on feeding the animals. It is important that the animals' drinking water source is safe and adequate. Animals can have health or feed consumption problems because of the water quality which has low standards. Therefore, it should be provided adequate and safe drinking water to animals in animal barns (Ozdogan et al., 2016).

If water is not provided in sufficient quantities, the animal will reduce feed consumption in order to reduce water loss to the animal due to water loss for a certain period of time. If water loss continues and thirst is not removed, various disorders occur in the body. Eventually it will be death. In order not to encounter such negativities, the water needs of the animals must be eliminated without interruption (Anonymous, 2014).

When the water needs of cattle, sheep and poultry are determined, it is necessary to distinguish the water taken from the body as drinking water and water taken with feed. The diets of animals and the amount of water they contain vary. For example, the water rate of dried feeds is 10-14%, while the proportion of water in the collected grasses and silages is around 60-80%. In order for animals to be cultivated healthily and to be able to obtain the desired quality, it is necessary to be a quality and continuous water source. The decrease in productivity due to low water usage directly affects the profitability of the producers (Cemek et al., 2011).

In this study, the annual water consumption of the animal barns was determined according to the animal existence in the Bursa region. In addition to this, the amounts of annual water demand of 4 different dairy cattle operations with 20,

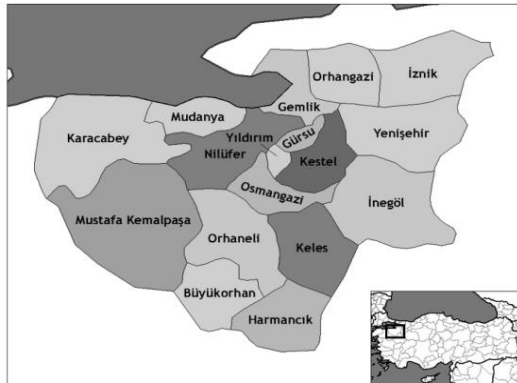
50, 100 and 200 head capacities have been calculated because water has an important effect on milk yield especially in dairy cattle.

### Materials and Methods

The research was carried out in the province of Bursa. The amount of water consumption in dairy cattle barns in Bursa was evaluated according to the number of barns and number of animals.

Bursa is located between 40° longitude and 28°-30° latitude circles in the southeast of Marmara Sea. A map of the province of Bursa is shown on the map.

In the province of Bursa, which is located in the Marmara region, has the Mediterranean climate characteristics (Korukçu and Arıcı, 1986). The average annual temperature is 14,56°C, the average maximum temperature is 20, 30°C and the average minimum temperature is 9,00°C (URL6).



Şekil 1. Bursa il haritası

Figure 1. Map of the Bursa province

According to TUIK 2017 data, there are 201 288 head cattle, 472467 head sheep and goats, and approximately 1.3 million head poultry in Bursa province. Table 2 shows the number of animals in Bursa province.

Table 1. Number of animals in Bursa

Tablo 1. Bursa ili hayvan varlığı

Years	Livestock	Sheep and Goats	Poultry
2006	131 635	303 794	6 441 392
2007	147 762	310 692	6 615 915
2008	146 319	270 227	6 270 609
2009	148 397	293 814	5 872 112
2010	159 263	329 837	5 586 221
2011	172 099	376 531	7 951 241
2012	188 673	423 968	8 691 424

2013	198 829	442 013	8 488 404
2014	191 955	465 345	9 116 011
2015	195 872	458 823	9 981 526
2016	186 145	441 859	11 191 583
2017	201 288	472 467	12 776 773

Daily drinking water requirements of cattle vary from 25 to 160 liters/day (Göncü et al., 2008). The daily drinking water requirement of cattle from different age groups is given in Table 3.

Table 2. Daily drinking water requirement of cattle (Grant, 1993)

Tablo 2. Süt sığırlarının günlük su gereksinimleri (Grant, 1993)

	Status	Water Consumption (lt /day)
Holstein Calf	1 month	5,0-7,5
	2 month	5,7-5,7
	3 month	8,0-10,6
	4 month	11,4-13,3
	5-9 month	14-20
Holstein Heifer	15-18	23-27
	18-24	28-36
Jersey Cattle	14 kg/day milk	50-60
	14 kg/ day milk	55-65
Holstein Cattle	23kg/ day milk	90-100
	36kg/ day milk	145-160
	45kg/ day milk	182-200
Dry Cow	6-9 months pregnant	35-50
Bull	500 kgCA	30-45
	600 kgCA	36-54
	700 kgCA	42-63

Water requirements of livestock depends on the several factors, such as weight, pregnancy, lactation, activity, type of diet, feed intake and environmental conditions (Schlink et al., 2010).

Water quality is extremely important for livestock in terms of their performance and health. There are 5 basic water quality criteria in cattle as in human drinking water. These criteria are based on organoleptic (taste and odor), physicochemical properties (pH, total solute matter, total soluble salts, and hardness), toxic compounds (heavy metals, toxic minerals, organophosphates and hydrocarbons), minerals and compounds (nitrates, sodium sulphates and iron) and the presence of microorganisms (Yaylak and Yavuz, 2016).

In the world, various standards related to the drinking water quality criteria of animals

are published. Socha et al. (2003) provided water quality criteria for livestock using different sources are presented in Table 4.

Table 3. Limit values for livestock drinking water

*Tablo 3. Büyükbaş hayvanlarda içme suyu kalitesini belirleyen kriterler*

Criteria	Threshold value	Limits
Aluminium	5.0	10.0
Arsenic	0.2	0.2
Barium	1.0	1.0
Bicarbonate	1000.0	1000.0
Boron	5.0	30.0
Cadmium	0.01	0.05
Calcium	100.0	200.0
Chloride	100.0	300.0
Chrome	0.1	1.0
Copper	0.2	0.5
Fluoride	2.0	2.0
Iron	0.2	0.4
Lead	0.05	0.1
Magnesium	50.0	100.0
Manganese	0.05	0.5
Mercury	0.01	0.01
Molybdenum	0.03	0.06
Nickel	0.25	1.0
Nitrate	20.0	100.0
Phosphorus	0.7	0.7
Potassium	20.0	20.0
Selenium	0.05	0.1
Argent	0.05	0.05
Sodium	50.0	300.0
Sulphate	150.0	900.0
Total solute	960.0	3000.0
Vanadium	0.1	0.1
Zinc	5.0	25.0
pH	6-8.05	8.5

The study was conducted in two stages. The first part is based on field studies and is based on collecting the water samples from 15 different dairy cattle enterprises. In addition, the current situation of watering facilities given to animals by drinking water has been assessed and problems and deficiencies have been identified.

In the second stage, the amount of water needed in the animal barns is calculated according to the number of animals in Bursa.

### Results and Discussion

According to TUIK 2017 data, there are 201288 head cattle, 472467 head small sheep and approximately 1.3 million head poultry in Bursa province. In this section, the amount of drinking water consumption was assessed according to the total animal numbers in Bursa. In addition, drinking water samples were taken from 15 dairy cattle barns in Nilüfer district of Bursa province and were analysed for water quality.

In 2017, the annual water requirement of total livestock, poultry, sheep and goats in Bursa province are respectively 6.6 million m<sup>3</sup>, 1.2 million m<sup>3</sup> and 862252 m<sup>3</sup>. The numbers of animals in Bursa and water consumption amounts are given in Table 4 in detail.

Table 4. Annual water consumption of dairy cattle, poultry and sheep, goats in Bursa (m<sup>3</sup>)

*Tablo 4. Bursa'da süt sığırlarının, kümes hayvanları ve keçi ve koyunların yıllık su tüketimi (m<sup>3</sup>)*

Years	Dairy Cattle	Poultry	Sheep and Goats
2006	4324209,8	587777,0	554424,1
2007	4853981,7	603702,2	567012,9
2008	4806579,2	572193,1	493164,3
2009	4874841,5	535830,2	536210,6
2010	5231789,6	509742,7	601952,5
2011	5653452,2	725550,7	687169,1
2012	6197908,1	793092,4	773741,6
2013	6531532,7	774566,9	806673,7
2014	6305721,8	831836,0	849254,6
2015	6434395,2	910814,2	837352,0
2016	6114863,3	1021231,9	806392,7
2017	6612310,8	1165880,5	862252,3

According to investigations made in enterprises in Bursa province, it is seen that water consumption is higher in the mountain

regions where the number of animals is high. In these regions it has been observed that there are no significant problems in

reaching natural water resources, which are sufficient and water quality is better. In the settlement units of Bursa province, the industrial and residential areas are gradually shifted towards the cultivated areas, causing pollution of water resources and especially decrease of well water. At the same time, it may increase the production costs due to the use of water from city networks. For this reason, although water consumption of animals is low, it is necessary to operate the planning of the usage water in order to prevent the total number of animals and the water shortage that may be encountered in the future. Accordingly, daily and annual water requirements should be clearly

defined, where to obtain drinking and usage water, storage facilities should be assessed.

In this study, the amounts of annual water demand of 4 different dairy cattle operations with 20, 50, 100, and 200 head capacities have been calculated because water has an important effect on milk yield especially in dairy cattle. The water consumption of these enterprises was respectively 648 m<sup>3</sup>, 1620 m<sup>3</sup>, 3240 m<sup>3</sup> and 6480 m<sup>3</sup> per year. The annual drinking and utility water costs of the enterprises are calculated as 2 722 ₺, 6 804 ₺, 13 608 ₺, and 27 216 ₺. The annual drinking and utility water costs of the enterprises are given in Table 5.

Table 5. The annual drinking and utility water costs of the enterprises  
*Tablo 5. İşletmelere ait içme ve kullanma suyu miktarları*

Head	Water consumption (m <sup>3</sup> /head)	Daily (m <sup>3</sup> )	Monthly (m <sup>3</sup> )	Yearly (m <sup>3</sup> )	Annual water costs (₺)
20	0,09	1,8	54	648	2722
50	0,09	4,5	135	1620	6804
100	0,09	9	270	3240	13608
200	0,09	18	540	6480	27216

## Conclusion

It is seen that the consumption of livestock's water is approximately 8.6 million m<sup>3</sup> in the province of Bursa compared to the total animal numbers of the year 2017. Water consumption has increased by 56% according to the number of animals from 2006 to 2017. This shows that the requirement for drinking water is increasing, due to the rising number of animals and the population day by day. On the other hand, the rapid development of the city and the build-up that threatens the countryside are affecting the water quality in the negative direction. Taking into consideration these drawbacks, it is necessary to plan the well-being of animal drinking water in the establishment of the enterprises. Especially, it is very important to protect the water resources that meet the water need of the animals in the pasture, to keep the water resources and structures of these institutions under observation, and to protect the areas where the animal barns are intensive.

The drinking water quality of the animals is directly influential on animal health and therefore on yield. Especially in intensive enterprises, the usage of water and drinking water has a significant effect on the quality of the production.

Today, while water resources are negatively affected by global warming, the amount of usable water is decreasing due to the fact that industrial and agricultural wastes are mixed into ground water. Uncontrolled wastes released by animal operations pollute water resources and misuse of the drinking water that animals need reduces water resources with the increase in the number of animals. If the required water is inadequate, water loss will occur in the animals. In order to prevent water loss, animals reduce feed consumption and consequently yield losses are encountered.

A conscious, efficient and effective use of drinking and usage water in livestock enterprises will both reduce the cost of the operation and prevent water wastage.

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